UNIDO

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

CONSULTATION ON DOWNSTREAM PETROCHEMICAL INDUSTRIES IN DEVELOPING COUNTRIES

Tehran, Islamic Republic of Iran
7–11 November 1993

REPORT

Distr.
LIMITED

ID/394
(ID/WG.533/5)
3 February 1994

ENGLISH

Preface

The Lima Declaration and Plan of Action on Industrial Development and Cooperation adopted by the Second General Conference of the United Nations Industrial Development Organization (UNIDO), held at Lima, Peru, in March 1975, and subsequently endorsed by the General Assembly, recommended that UNIDO should include among its activities a system of continuing consultations between developed and developing countries with the object of raising the developing countries' share in world industrial output through increased international cooperation.[1]

In May 1980, the Industrial Development Board of UNIDO decided to put the System of Consultations on a permanent basis and, in May 1982, it adopted its rules of procedure[2] setting out its principles, objectives and characteristics, notably:

(a) The System of Consultations should be an instrument through which UNIDO would serve as a forum for developed and developing countries in their contacts and consultations directed towards the industrialization of developing countries;[3]

(b) Consultations would also permit negotiations among interested parties at their request, at the same time as or after consultations;[4]

(c) Participants of each country should include officials of Governments as well as representatives of industry, labour, consumer groups and others, as deemed appropriate by each Government;[5]

(d) Final reports of the meetings should include such conclusions and recommendations as agreed upon by consensus among the participants. The reports should also include other significant views expressed during the discussion.[6]

Since 1975, Consultation meetings have been convened on agricultural machinery, building materials, capital goods, electronics, fertilizers, fisheries, food processing, industrial financing, iron and steel, leather and leather products, non-ferrous metals, petrochemicals, pharmaceuticals, small- and medium-scale enterprises, the training of industrial manpower, vegetable oils and fats, and wood and wood products. Four Consultation meetings on the petrochemical industry have been held at Mexico City (1979), Istanbul (1981), Vienna (1985) and Innsbruck (1992).

The Consultation process, by virtue of its consensual and normative character, has revealed itself to be an efficient vehicle for fostering cooperation. It is eminently suited to assist member States in the formulation of strategies and policies for industrial development.

The System of Consultations operates under the continuous and close guidance of the Industrial Development Board. In addition to undergoing annual reviews and periodic appraisals, the System was subjected to an in-depth evaluation in 1989, which concluded that it was making a major contribution to the development and formulation of UNIDO policies and programmes in specific sectors through integration and interaction with the other main activities.

---

[1] *Report of the Second General Conference of the United Nations Industrial Development Organization* (ID/CONF.3/31), chap. IV, "The Lima Declaration and Plan of Action on Industrial Development and Cooperation", para. 66.

[2] See *Draft rules of procedure for the System of Consultations* (ID/B/258), annex.

[3] *Official Records of the General Assembly, Thirty-fifth Session, Supplement No. 16* (A/35/16), vol. II, para. 151 (a).

[4] Ibid., para. 151 (b).

[5] Ibid., para. 152.

[6] Ibid., *Thirty-second Session, Supplement No. 16* (A/32/16), para. 163.

Contents

	Paragraphs	Page
Preface		1
Introduction	1-18	4
A. Background	2-11	4
B. Preparatory activities	12-16	5
C. Issues	17	6
D. Objectives	18	6
Agreed conclusions and recommendations	19	7
Chapter		
I. Organization of the Consultation	20-43	10
A. Opening of the Consultation	20-32	10
B. Presentation of UNIDO activities	33-39	11
C. Election of officers	40	13
D. Adoption of the agenda	41	13
E. Documentation	42	14
F. Adoption of the report	43	14
II. Report of the plenary sessions	44-73	15
A. Presentation of the issues	44-54	15
B. Summary of discussion	55-73	16

Annexes

I. List of participants	21
II. List of documents	31

Introduction

1. The Consultation on Downstream Petrochemical Industries in the Developing Countries was held at Tehran, Islamic Republic of Iran, from 7 to 11 November 1993. It was attended by over 140 participants from 29 countries and one international organization (see annex I).

A. Background

2. In today's world, downstream petrochemical products such as plastics, fibres, synthetic rubbers and copolymers have surpassed traditional materials such as metal, wood, glass, natural fibre, rubber and paper not only in economy, but also in performance. Processed products from downstream petrochemicals are continuously replacing traditional materials on the basis of their enhanced efficiency while finding new uses in areas of basic human needs such as agriculture, food, clothing, shelter, water management and health care, and contributing innovatively to the motor-car and electronics industries and to space technology.

3. For example, water treatment and irrigation systems have become much cheaper and more efficient with the use of polyvinyl chloride (PVC) pipes and plastic components. Dramatic advances in personal computers or home entertainment devices such as video cassette recorders would not have been possible had manufacturers had to rely on metal, wood or glass as their primary materials. With the extensive use of innovative plastics, motor cars and lorries are much more fuel-efficient. Life-saving medical procedures such as angioplasty are now routinely available. Several foods, drinks and consumer products simply could not be marketed without plastic packaging.

4. Much of the improvement in the standard of living in developed regions is associated with the availability of downstream petrochemical products. The petrochemical industry evolved in three developed regions, namely, North America, western Europe and Japan, all of which experienced a rapid increase in the consumption of the downstream products of the industry. The excess products from these regions were exported to developing countries.

5. The oil price increases of the early 1970s forced the industry to undertake massive restructuring and consolidation. Capacities for basic petrochemicals were built in proximity to the raw materials and the markets or both. Thus, new plants were built in Latin America, the Middle East and South-East Asia that resulted in overcapacity. This, in turn, led to low capacity utilization and lower margins, which undoubtedly had, and will continue to have, a negative effect on the entire industry.

6. By 1995, the world's ethylene capacity is projected to be 86 million tonnes per year against a demand of 72 million tonnes per year, resulting in a capacity utilization of 83.7 per cent. Some regional imbalances are even greater. In 1990, ethylene production in western Europe was 14.7 million tonnes against a capacity of about 17.5 million tonnes. By 1996, production is projected to increase to 20 million tonnes per year against a projected demand of 15 million tonnes per year.

7. In South-East Asia, ethylene capacity is expected to reach 23 million tonnes per year against a demand of 21.45 million tonnes per year by the year 2000. By that time, the ethylene capacity of the Middle East will be 6.31 million tonnes per year amounting to 6.5 per cent of the global capacity. Thus South-East Asia, a traditional market for Japanese and Middle Eastern producers, will become

a surplus region, prompting Middle Eastern producers, to try to sell their surplus products to the European market.

8. Although the demand for downstream petrochemical products has plateaued somewhat in the developed regions, it is expected that the demand will grow in developing regions where the current per capita consumption is low and where a large number of the basic needs of the growing population still need to be satisfied.

9. One of the important characteristics of the pattern of demand for downstream petrochemical products is that where there is low per capita consumption, demand has been observed to triple or quadruple as soon as products are manufactured locally. For example, the consumption of plastic resins in Saudi Arabia has reached 300,000 tonnes per year, a twentyfold increase over the consumption of 15,000 tonnes per year a decade ago when the country started to produce its own plastics. More than 200 firms are now involved in processing plastics in Saudi Arabia.

10. Likewise, recent political and economic changes in the countries of the former Union of Soviet Socialist Republics and eastern European countries have opened new avenues for demand-led growth for downstream petrochemical products. In the newly independent States of the former Soviet Union, the installed polyethylene capacity is only 1 million tonnes per year. It has been predicted that over the next five years, there will be a significant increase in the consumption of plastics in that area and elsewhere in eastern Europe, and that this demand will have to be met by imports.

11. Given the global overcapacity for basic petrochemicals, the downstream petrochemical industry could tap the huge potential for demand-led growth for its products thus easing the strain that the global petrochemical industry is experiencing.

B. Preparatory activities

12. As part of the preparations for the Consultation meeting in Tehran, a Regional Consultation on the Petrochemical Industry in the Arab Countries was held at Innsbruck, Austria, in June 1992. That meeting recommended that:

> "The downstream processing industries should be established wherever viable to increase the use of petrochemicals in various sectors of activity, particularly construction, agriculture, clothing and health care, which offer a large potential for domestic market development substantiated by detailed market studies."[1]

13. Accordingly, two technical reports, one dealing with national strategies for the development of downstream petrochemical industries in developing countries, and one dealing with environmental conservation were prepared. The first report identified major constraints to, and opportunities for, the growth of the downstream petrochemical industries and delineated the elements of a coherent sectoral strategy. The second report scrutinized the issue of environmental protection in the context of various industrial activities by assessing wastes and pollutants and elaborating on methods and tools of a comprehensive waste-management system.

14. In addition, the secretariat convened the Global Preparatory Meeting for the Consultation on Downstream Petrochemical Industries in the Developing Countries at Vadodara, India, from

---

[1] "Regional Consultation on the Petrochemical Industry in the Arab Countries", Innsbruck, Austria, 22-25 June 1992 (ID/383), para. 12 (6).

23 to 25 February 1993, which was attended by 24 participants from 11 countries. The Meeting was held in cooperation with the Indian Petrochemicals Corporation.

15. The main objectives of the Meeting were:

(a) To review the current status of and future prospects for the downstream petrochemical industries, particularly in the subsectors dealing with plastics, synthetic fibres and synthetic rubbers;

(b) To identify priority issues for the consideration of the Consultation on Downstream Petrochemical Industries in the Developing Countries.

16. During the Meeting, the participants reviewed the current status of the downstream petrochemical industries, comprising the subsectors of plastics, synthetic fibres and synthetic rubbers and examined the following topics:

(a) Prospects for and constraints on the growth of the downstream petrochemical industries in the developing countries especially plastics, synthetic fibres and synthetic rubbers;

(b) Integration of downstream petrochemical industries into other sectors of the economy with emphasis on marketing, and product and market development;

(c) Environmental protection and safety in the development of downstream petrochemical industries;

(d) Enhancement of the technological base of the developing countries in order to promote the growth of downstream petrochemical industries, with special reference to assessing information related to engineering and construction capabilities and the use of locally available resources.

C. Issues

17. After in-depth discussions of the topics raised in the secretariat paper entitled "The current status of and future prospects for the downstream petrochemical industries in the developing countries" (ID/WG.533/1), the Meeting identified the following issues for submission to the Consultation at Tehran:

(a) Manufacturing and application technologies for downstream petrochemical industries;

(b) Marketing of, and market development for, petrochemicals.

D. Objectives

18. It was also determined that the main objectives of the Consultation at Tehran should be:

(a) To formulate concrete recommendations on the issues identified by the Global Preparatory Meeting, addressing policy matters as well as technological and financial aspects on the basis of the key role that international cooperation played;

(b) To promote contacts between participants with a view to developing projects for technical cooperation, technology transfer and investment promotion.

Agreed conclusions and recommendations

19. The Consultation on Downstream Petrochemical Industries in the Developing Countries agreed on the following conclusions and recommendations:

Preamble

(1) Developing countries attach the utmost importance to the development of downstream petrochemical industries because the products of these industries contribute directly to the satisfaction of some of the basic needs of their populations. The development of these industries not only helps to strengthen the technological capabilities of the developing countries, but also enhances economic development, generates employment and reduces reliance on imported materials, and thus alleviates poverty. Furthermore, the development of diversified downstream petrochemical industries is a significant factor in increasing the industrial productivity of developing countries by strengthening their industrial structure.

(2) A long-term integrated national strategy for the development of domestic downstream petrochemical industries will take into account the overall development objectives, the existing production structure and the needs of the agricultural, construction, textile and small-scale industries sectors in particular.

Conclusions and recommendations

(3) In establishing downstream petrochemical industries, developing countries should consider the necessary conditions for the success and viability of such projects, paying particular attention to the following areas:

(a) Assessment of markets, with strong emphasis on domestic outlets;

(b) Participation of local entrepreneurs;

(c) Human resource development and technical training;

(d) Promotion of applications for finished products;

(e) Quality control and quality assurance, including after-sales services as well as value analysis techniques;

(f) Environmental protection and safety of operations.

(4) The effective transfer of technology should include not only the provision of engineering packages and related equipment, but also the means of building up local capacity to assimilate the technology transferred and to improve on products and processes.

(5) Due regard should be paid to the development of local capability to participate in plant design and to undertake construction. Technical standards and specifications for the design and erection of plants should be adapted to local conditions without relaxing safety and environmental requirements or reducing operational efficiency.

(6) At the initial stages of setting up these industries, some developing countries could focus on relatively practical steps such as the development of new compounding technologies and the modification of plastics and other products to increase value added.

(7) The petrochemical industry should adopt the best prevailing practices in regard to environmental protection, and internationally accepted practices in matters related to safety at the workplace.

(8) Economic and technical cooperation in the downstream petrochemical industries should be promoted between developing countries, particularly with a view to:

(a) Furthering regional cooperation to tap the potential of larger markets. In order to do so, particularly in the context of Africa, UNIDO should conduct a demand/supply market survey for the main petrochemical products;

(b) Facilitating the development and/or expansion of linkages between upstream and downstream petrochemical industries;

(c) Pooling resources, particularly by the exchange of information and experience;

(d) Promoting transfer of technology, know-how and research and development.

(9) The Consultation notes with gratitude the offer of the Islamic Republic of Iran to share with other developing countries its technical and managerial experience in research and development as well as in manufacturing in certain downstream petrochemical industries, such as the tyre and rubber industries.

(10) Cooperation between industrialized and developing countries could, *inter alia*, take the following forms:

(a) Promoting enterprise-to-enterprise cooperation;

(b) Making technology and expertise available to developing countries under competitive market conditions;

(c) Bilateral/multilateral cooperation to strengthen the existing national and regional technical development centres;

(d) Assisting developing countries, particularly those in Africa, with funds and training materials to meet their human resource development needs.

(11) To provide a fillip to such cooperation, a technical training centre for downstream petrochemical industries should be established by UNIDO through financial contributions from member States and interested organizations. Moreover, the centres that already exist should be upgraded in terms of equipment and faculty experience through such cooperation.

(12) Programmes of joint activities currently carried out by UNIDO in the field of petrochemicals should be encouraged and extended to other interested parties.

(13) Expert group meetings on specific products should be held in those countries that have valuable experience to share. UNIDO should convene a regional meeting of experts, investors and managers, possibly in Africa, to promote the manufacture and application of plastics.

(14) UNIDO should establish a petrochemical database centre to serve as a tool for information collection and dissemination and to provide help to petrochemical enterprises in marketing, technology transfer, environmental impact assessment, safety hazards and feasibility studies including the regional availability of process technologies, machinery and technical personnel.

(15) To ensure the effectiveness of investment promotion, it is important that both member States and UNIDO undertake adequate preparatory activities, including the identification of investment opportunities by the preparation of profiles of downstream petrochemical production plants.

(16) Quality control and quality assurance are vital prerequisites for the further optimization of production parameters, the improvement of productivity, cost-effectiveness and development of markets, particularly for performance products and products for export. Consequently, countries should acquire or improve capabilities for carrying out quality control and value analysis. These quality control centres should then assist industry, especially small-scale industry, in introducing quality assurance. These quality control centres should preferably be organized and supported by the industry.

(17) UNIDO should strengthen its ongoing efforts to implement technical cooperation projects in the area of plastic recycling, offering the most appropriate technology to developing countries, taking into account such factors as physical environment, pattern of usage, employment generation, market structure and purchasing power. UNIDO should, when necessary or requested, undertake efforts with a view to increasing the awareness of developing countries about state-of-the-art technologies for plastic recycling.

I. Organization of the Consultation

A. Opening of the Consultation

Statement by the Minister of Industry of the Islamic Republic of Iran

20. The Minister of Industry of the Islamic Republic of Iran, His Excellency Mohammed R. Nematzadeh, inaugurated the Consultation and welcomed the participants. He elaborated three essential points in his statement.

21. First, the production of petrochemicals and the manufacture of downstream products from petrochemicals, because of their comparative advantage, had had a special priority in the development plans of the Islamic Republic of Iran. Consequently, the volume of petrochemical products during the previous four years had increased by 100 per cent. The Minister announced that that priority would continue to be accorded to the development of downstream petrochemical products in the next Five-Year Development Plan also.

22. Second, the Islamic Republic of Iran was inviting the participation of foreign-based firms in its industrialization efforts, especially in the field of downstream petrochemicals. The Government was prepared to offer all the necessary guarantees to those firms as it believed that that would not only boost its privatization efforts, but would also generate employment. According to an Iranian survey, one job in the petrochemical industries created 20 jobs in the downstream and related industries.

23. Third, the Islamic Republic of Iran offered some very important advantages to investors and other international partners, such as its vast market, abundant raw materials, qualified personnel and, above all, its willingness to eliminate redundant rules and procedures.

Statement on behalf of the Director-General of UNIDO

24. The Director of the System of Consultations, speaking on behalf of the Director-General of UNIDO, said that the presence of a large number of participants representing industrial, entrepreneurial, financial and other interests was a clear testimony of the importance attached to the downstream petrochemical sector and underscored the relevance of the debate that its problems evoked.

25. He added that the petrochemical industry had played a vital role in the development of the global economy and its wide range of products had contributed to economic prosperity and human well-being. The technical advances in the industry were not confined to the basic processes alone; they had been closely involved in creating new products that not only competed with, but also excelled when compared with traditional materials.

26. The increase in the standard of living in the developed regions had been shown to be largely accompanied by the availability of downstream petrochemical products. Therefore, if the downstream industries in the developing countries were able fully and successfully to tap that vast market, then the potential contribution to their economies could be enormous.

27. Developing energy-efficient and environmentally friendly technologies for both upstream and downstream petrochemical production would be the key to the success of the industry in the future. The growth of petrochemical processing industries, especially those of plastics, would in future largely depend on the local demand for finished products and, to a much lesser degree, on export markets. The growing demand for the products in the developing countries would also provide ample employment opportunities, thus addressing a major social need in those countries.

28. He said that based on the experience of UNIDO, which was considerable and backed by 25 years of work in the field of petrochemicals in developing countries, and the preparatory activities undertaken by a group of experts from developed and developing countries, it had been suggested that the Consultation should focus on two basic issues: one, manufacturing and application technologies for downstream petrochemical industries; and two, marketing of, and market development for, petrochemicals.

29. In conclusion, he stated that the objective of the Consultation was to determine a workable policy approach and a climate favourable to improving and integrating the downstream petrochemical industries with the rest of the national economy in the developing countries. That was vital in order to identify an effective means of securing long-term benefits for those countries as they went about the task of mastering new technologies and promoting the processing of value-added downstream petrochemical products within the broader context of achieving their industrialization objectives.

Statement by the Chairman of the Consultation

30. The Chairman welcomed all the participants to the Consultation meeting, particularly the representatives of different countries and organizations. He thanked them for having elected him as well as the other members of the Bureau.

31. The Chairman praised the past and present staff of the System of Consultations Division of UNIDO for their hard work in preparing the Consultation. He was gratified by the efforts of UNIDO to increase the capabilities and capacities of developing countries and to improve the quality of technical cooperation between those countries as a result of that type of meeting. The Chairman also thanked the Managing Director of the Behran Oil Company for his cooperation in launching the important gathering in his country.

32. With the help of positive contributions from participants and from UNIDO staff, the Chairman hoped that the Consultation would arrive at meaningful conclusions and recommendations. Those, he was confident, would soon become a key element for closer cooperation between UNIDO and the developed and developing countries, leading to the implementation of concrete projects.

B. Presentation of UNIDO activities

33. A UNIDO staff member reported that industrialized countries had invested much effort in reducing the quantity and cost of the plastic used while maintaining or even improving the quality of the end-product. That result had been achieved by:

(a) Introducing and improving quality control and quality assurance;

(b) Improving the operating methods of the plastics transformation equipment;

(c) Improving product and mould design;

(d) Optimizing in-plant recycling;

(e) Using computer programmes to determine the optimum use of plastic for a given purpose.

34. The staff member added that the majority of plastic transformation companies in both developed and developing countries were in the small- and medium- industry category. Many of them could not afford expensive quality control laboratories or teams of highly qualified engineers to optimize operating methods and improve product and mould design. In highly industrialized countries, such companies had access to plastics research and development institutes, the services of experienced consultants, information services, institutes for training their machine operators and advice from manufacturers of plastic transformation machinery. Those sources of assistance, however, were not available to small- and medium-sized plastics transformation companies in the majority of the developing countries.

35. Regarding industrial investment promotion, another staff member of UNIDO said that increasing attention was being accorded by developing countries to attracting foreign investment resources, which had led to considerable competition between developing and developed countries. He described the main output of the division of UNIDO responsible for industrial investment, such as the successful conclusion and promotion of investment projects, improvement of the investment climate and establishment of investment promotion institutions and training. He also explained the methodology and tools that UNIDO used in offering its integrated technical cooperation programmes.

36. Speaking on the topic of the environmental impact of downstream petrochemical industries, another UNIDO staff member reported that, although the petrochemical industry was considered "cleaner" than many other industries, the production of basic petrochemical products such as ethylene, propylene, butadiene, benzene and xylene had created large quantities of commodity plastics such as high-density polyethylene (HDPE), low-density polyethylene (LDPE), PVC, and polystyrene (PS) which were widely in use. Furthermore, other derivatives from oil, natural gas or naphtha such as synthetic fibres, synthetic rubbers, detergents and additives were also commonly used in many countries. All those products had generated different types of wastes.

37. Only a very few developing countries had taken action on the avoidance, recycling and conversion of wastes, which, although welcome, was far from adequate. Given the aspirations of the developing countries with respect to industrial development and increased standards of living, the recycling and conversion of waste would become one of the major issues of the next century. The lack of trained human resources, inadequate legislative and implementation systems, and the absence of proper data on generated, recycled and disposed-of wastes, as well as other social, political and economic constraints, would hamper progress for any concentrated action.

38. On the establishment and operation of a UNIDO database on petrochemicals, a UNIDO staff member reported that:

(a) A "Directory on technological capabilities in developing countries related to the petrochemical industry" had been prepared and was being updated;

(b) A proposal for a UNIDO petrochemical database centre had been prepared;

(c) A sample of an issue paper entitled: "Petrochemical industry development options" had been prepared covering 1992;

(d) A total of 400 technological profiles of petrochemical and related industries had been collected;

(e) A sample overview of the production capacities in industrialized countries for 40 petrochemical products had been prepared.

The representative added, however, that in order to proceed with the expansion of the database, UNIDO had to search for potential customers and respond to their specific interests for information on petrochemicals.

39. The representative explained that the following types of customer might be interested in joining the database centre and sharing information with other members:

(a) Governments, for strategic planning purposes and guidance concerning the issuance of investment approvals and/or adoption of certain policy measures;

(b) Petrochemical companies, in order to assess their position in global and regional markets, the commercial potential of their products and to conduct investment planning;

(c) Trading companies, to find out sources of supply for competitive bidding purposes, as well as to gather offers for spare parts, catalysts and specialized chemicals;

(d) Other companies, in order to seek out potential markets.

C. Election of officers

40. The following officers were elected:

Chairman: Ahmad Ahmadi (Islamic Republic of Iran), Counsellor, Permanent Mission of the Islamic Republic of Iran to UNIDO

Rapporteur: Lalitha B. Singh (India), Adviser (Petrochemicals), Ministry of Chemicals and Fertilizers

Vice-Chairmen: Jürgen Weingartner (Austria), Weingartner Consulting

Kasende Okuma (Zaire), Directeur, Chef de Département, Commission nationale de l'énergie, Ministère de l'énergie

Constantin Roncea (Romania), Engineer and Deputy Director, Petrobrazi S.A.

D. Adoption of the agenda

41. The following agenda was adopted:

1. Opening of the Consultation.

2. Election of the Chairman, Vice-Chairmen and Rapporteur.

3. Current status of, and prospects for, the petrochemical industry in the developing countries.

4. Review of UNIDO activities and capabilities in the petrochemical industry.

5. Presentation of the issues.

6. General discussion and statements by participants.

7. Discussion of the issues:

   (a) Manufacturing and application technologies for downstream petrochemical industries;

   (b) Marketing of, and market development for, petrochemicals.

8. Technical plant visit to Aliaf Chemical Fibres Company.

9. Bilateral and multilateral contacts for technical cooperation, investment promotion, technology transfer projects and other cooperation arrangements in the downstream petrochemical industries, and consultations with UNIDO substantive officers.

10. Adoption of the conclusions and recommendations of the Consultation.

E. Documentation

42. The documents issued prior to the Consultation are listed in annex II.

F. Adoption of the report

43. The report of the Consultation on Downstream Petrochemical Industries in the Developing Countries was adopted by consensus at the final plenary on 10 November 1993.

II. Report of the plenary sessions

A. Presentation of the issues

Manufacturing and application technologies for downstream petrochemical industries

44. A UNIDO consultant introduced the issue of manufacturing and application technologies for downstream petrochemical industries. He said that the integrated petrochemical industry involved a whole range of technological processes, which originated mostly from a few basic chemicals.

45. He described the intermediates that were derived from the basic petrochemicals. They were used for the manufacture of different end-products or served other industrial outlets. These included such compounds as ethylene oxide, ethylene glycol, acetic acid, alkylbenzenes, terephthalic acid (PTA) and dimethyl terephthalate (DMT), phthalic anhydride, methanol and monomers such as vinyl chloride (VCM), vinyl acetate (VAM), styrene and carbon black.

46. The range of petrochemical end-products was wide and diverse. There were large varieties of plastics, both thermoplastics and thermosets. The major thermoplastics were LDPE, PVC, HDPE, polypropylene (PP), PS and acrylonitrile-butadiene-styrene (ABS). The thermosets were phenol-formaldehyde (PF), urea-formaldehyde (UF), melamine-formaldehyde (MF), epoxy and unsaturated polyesters. In addition, a large variety of engineering plastics and specialty polymers had critical applications in areas requiring stringent performance criteria. The range of usage of plastics was also wide enough to encompass almost all facets of daily life as well as such important sectors as agriculture, transportation, communications, defence, aviation, space research and electronics.

47. The global production of major plastic materials was expected to double by the year 2000. A speedy expansion in production capacity was expected of synthetic fibre mainly because of the polyester fibres. The growth rate of synthetic rubbers would remain dependent on the demand for them in the motor-car sector.

48. Although commodity plastics continued to dominate, performance plastics had registered a high demand growth rate in the newly industrializing countries and areas such as Hong Kong, the Republic of Korea, Singapore and Taiwan Province of China. Countries such as China and India had been consuming a large variety of those materials but in comparatively smaller quantities. Some plastics such as ABS, acetals, PS, styrene-acrylonitrile and thermosets were manufactured for captive consumption but the demand for them was largely met through imports.

49. Although petrochemical plants were mostly in the private sector in developing countries, India was a country where the large industries including the petrochemical sector had continued to remain in the public sector. However, to meet the huge local demand, expansion was taking place in the private sector. The processing (conversion) industries of the major petrochemical end-products were mainly in the private sector.

50. It was necessary for new petrochemical-rich countries in developing regions to strengthen the linkages between the petrochemical sector and other sectors of economy for the effective and efficient utilization of such materials as plastics, fibres and rubbers.

Marketing of, and market development for, petrochemicals

51. A representative from the host county introduced the second issue by stating that the marketing of the final product was often the single most important factor for the financial viability of a manufacturing project. Currently, many developing country producers of basic and intermediate petrochemical products were dependent upon export markets; however, with the changing fortunes of industry worldwide, they had become vulnerable to such external problems as global overcapacity, saturated export markets, volatile prices and economic recession in the consumer countries.

52. It had become crucial for the producers to develop national and regional markets for their products. That was an especially attractive alternative, as a large potential existed because the consumption level of downstream petrochemical products was still low in most developing regions compared with industrialized countries.

53. National and regional markets could be developed, on the one hand, by encouraging the establishment of downstream industries and, on the other hand, by an effective marketing strategy. The marketing strategy, he said, should encompass the following areas: availability, prices, specifications and customer orientation, and market intelligence and information.

54. He concluded by identifying the major marketing difficulties in the petrochemical industries in developing countries. Those were:

(a) The limited size of the domestic market for basic and intermediate products owing to the slow development of downstream industries and the low per capita consumption;

(b) The lack of adequate marketing experience and skills;

(c) The increasing role of the new forms of trade engaged in by corporate entities;

(d) The severity of competition in the international market;

(e) The existence of trade barriers, between developing countries and the international market, of a tariff or non-tariff nature, discouraging the export of petrochemicals to markets in developed countries;

(f) The lack of cooperation and coordination in the strategic industrial plans of developing countries as well as the absence of such cooperation interregionally;

(g) The lack of adequate infrastructural facilities for easy transport of products, storage and distribution;

(h) The weakness or non-existence of after-sales services;

(i) The unavailability of market information and intelligence.

B. Summary of discussion

Technology

55. The participants emphasized the need for local assimilation of imported technology, without which a meaningful transfer of technological know-how could not be achieved. Furthermore, in view

of the changing nature of production technologies, the availability and accessibility of technical information had become imperative. Many participants voiced their concern that in developing countries, such access to updated technical information was limited with dire consequences for their operational and planned petrochemical projects. Without such technical support, the difficulties in satisfying specific customer demands for end-products would prove difficult to overcome.

56. On a related matter, several participants expressed their concern about the maintenance of internationally recognized standards of quality control and product specification. In particular, international trade and exports could not be even envisaged in the absence of such norms, which unfortunately was quite usual in many developing countries.

57. Several participants from developing countries described the current status of their downstream petrochemical industries with particular emphasis on endogenously developed technological capabilities, offering them to other developing countries. They proposed various types of cooperation arrangements to transfer those technologies, which were often more suitable to the general conditions of developing countries compared with the processes available from traditional technology holders in the industrialized countries.

58. The participants from Africa reaffirmed the need to pool technological and other resources at a regional level to ensure the viability and competitiveness of their national petrochemical industries. In the establishment and operation of such industries, Africa was confronted by a host of problems, some of which pertained to the industrialization process in general, but quite a few of which were peculiar to the downstream petrochemical industries. Among those problems were technologies, technical and market intelligence, human resources, physical and institutional infrastructure and regional cooperation.

59. Many participants felt that in order to overcome the problems associated with technology in developing countries, research and development centres should be closely linked with, and supported by, the manufacturers, which would greatly facilitate the assimilation of technologies. Such interaction between operational and research activities would also contribute significantly to the attainment of efficiency and even marketing objectives.

60. In order to facilitate meaningful international cooperation for technical cooperation, investment promotion and other cooperative arrangements, participants emphasized the importance of creating a climate of confidence, establishing infrastructure, planning accurately, controlling project implementation, developing human resources, and providing for environmental protection and safety.

61. Several participants pointed out that, in many cases, a large part of the necessary technical equipment and machinery, such as processing vessels, piping, instrumentation, storage tanks and heat exchangers, could be obtained locally or nationally. They stressed the desirability of fully utilizing those resources before considering importing them.

62. The participants agreed that the development of diversified downstream industries strengthened and accelerated the industrialization process by bringing about marked productivity increases in the other industrial sectors using their products and in agriculture, thus leading to an improved utilization of national resources.

63. Some participants felt that in view of the rapid changes in technology and constantly emerging technologies, a compilation of some sort of directory or database might prove useful to the developing countries. UNIDO was asked to continue and strengthen its efforts for the expansion of its petrochemical database.

64. It was agreed that enterprise-to-enterprise cooperation constituted a viable and mutually beneficial vehicle to foster international cooperation between industrialized and developing countries in establishing downstream petrochemical industries and assuring a genuine transfer of technology and know-how.

65. Many participants agreed that in the context of downstream petrochemical industries, a significant and often crucial role was played by small- or medium-sized enterprises. Often, those industries, in view of their inherent characteristics and modest means, had little access to both technology and technical information, which in turn greatly reduced their technological options and resulted in inadequacies and cost-overruns in production. UNIDO and other international agencies were, therefore, requested to strengthen their efforts in assisting the small- and medium-scale enterprises in the petrochemical sector in tackling that problem.

66. The participants commended the secretariat for the scope and depth of the documentation submitted to the Consultation and expressed their conviction that the analysis and information contained therein would prove beneficial to them.

Marketing

67. The crucial importance of marketing and market development was emphasized by many participants who pointed out that, generally, the petrochemical industries of developing countries had been established as a consequence of the availability of raw materials and feedstock, rather than as a result of identified and well-surveyed market needs. Therefore, in most developing countries, the efforts deployed in the area of marketing and market development had not kept pace with those in other segments of the industry such as plant erection and purchase of technology and know-how. The participants opined that a rectification of the imbalance would facilitate the proper development of downstream petrochemical industries.

68. Some participants mentioned that in many instances in the developing countries, petrochemical products had been and still were manufactured without adequate provisions for market survey, need identification, market development, technical and after-sales services etc. Therefore, the real market potential for such products often remained untapped in the absence of such initial inputs.

69. The participants from Africa underscored the crucial role of identifying the nature and scope of the demand for the products of downstream petrochemical industries prior to embarking on costly investment projects. They therefore requested UNIDO assistance in carrying out regional market surveys for selected products, particularly plastics, in various regions of Africa. The participants agreed to reflect that particular request in their recommendations.

70. For the growth of downstream petrochemical industries to take hold in the developing countries, a number of conditions with respect to marketing must have been met. In addition to according a higher priority to marketing and market development, the provision of physical infrastructure such as ports, roads, transportation and communication systems, storage and distribution networks and product development were also judged by the participants to be indispensable. Such infrastructure would also serve the overall objectives of national economic development.

71. Some participants stated that the marketing of petrochemical products offered potentially lucrative possibilities for international and regional cooperation basically because of the complementarity of interests where countries or regions had differing capabilities with respect to feedstocks, mastery of technology, market outlets and industrial experience etc.

72. Some participants pointed out that as downstream petrochemical industries were generally fragmented and small scale in scope, the required expertise and experience for marketing and market development were simply not available to entrepreneurs at the local level. Therefore, some external assistance from agencies, research and development centres, international organizations, development institutions etc., must be provided in order to bridge the gap in technical know-how. UNIDO was therefore requested to continue and strengthen its efforts directed towards small- and medium-scale industries.

73. Some participants pointed out that in the foreseeable future, the volume of recycled materials, particularly plastics, would reach such a level that marketing strategies for recycled materials rather than virgin products would have to be conceived. That additional source of materials was gaining in importance in developing countries deficient in oil and gas, where the contribution of recycled plastics to the satisfaction of domestic demand could be quite significant in the years to come.

Annex I

LIST OF PARTICIPANTS

Austria

Jürgen Weingartner, Weingartner Consulting, Grosse Stadtgutgasse 20, A-1020 Vienna (Telephone: 0043-1-216-53-80)

Bahrain

Yusuf Ebrahim Fakhroo, Marketing Manager, Gulf Petrochemical Industries Company, P.O. Box 26730, Manama (Telephone: 973-731-777; Telex: 9897 kemia bn)

Bangladesh

Shabbir Ahmed, Deputy Chief Engineer, Bangladesh Chemical Industries Corporation (BCIC), Bhaban, 30-31 Dilikusha Commercial Area, Dhaka-1000 (Telephone: 880-2-25-98 52 or 880-2-25-15-38; Telex: 67 58 47 bcic bj or 63 22 16 bcic bj)

Chad

Ouchar Hisseine, Chef, Division de la promotion et planification des industries, Ministère du commerce et de l'industrie, B.P. 424, N'Djamena (Téléphone et téléfax: 51-27-33)

China

Dihua Wu, Vice-President, SINOPEC, 24 Xiao Guan St., An Ding Men Wai, Beijing (Telephone: 86-1-42-66-731-311; Telex: 22655 cpcci cn; Telefax: 86-1-4222812)

Yunguang Hu, Chemical Engineer, Shanghai Research Institute of Petrochemical Technology, SINOPEC, 110 Dongge Rd., Shanghai 201208 (Telephone: 86-21-88-48-509 or 86-21-88-48-686, extension: 313; Telefax: 86-21-8848034)

Yong Zhang, Engineer, SINOPEC, 24 Xiao Guan St., An Ding Men Wai, Beijing (Telephone: 86-1-42-66-617; Telex: 22655 cpcci cn; Telefax: 86-1-42-22-812)

Jianmin Zhu, Engineer, SINOPEC, Hui Xin East St. A-6, Beijing 100029 (Telephone: 86-1-4225533, extension: 4436/4410; Telefax: 86-1-4229632)

Colombia

Fernando Dario Mesa, Planning Department, Colombian Oil Company (ECOPETROL), Carrera 13, No. 36-24, Piso 8, Bogotá (Telephone: 28 78 007)

Ethiopia

Getahun Mamo Bedane, Research Promotion Expert, Technology Research and Policy Department, Ministry of Industry, P.O. Box 704, Addis Ababa (Telephone: 15-32-57)

Guinea

Mamady Touré, Ingénieur chimiste, Chargé d'études, Division de la politique et des stratégies industrielles, Direction nationale du développement industriel, Ministère de l'industrie et des petites et moyennes entreprises, B.P. 468, Conakry (Téléphone: 44-18-31 ou 44-34-50; Téléfax: 224-44-39-90; Télex: 22 371 mindus ge)

Guinea-Bissau

Hemiterio Arlindo Lopes Da Costa, Chef, Département de la planification industrielle, Direction générale de l'industrie, B.P. 311, Bissau (Téléphone: 21-57-36 ou Téléfax: 245 20 16 34)

India

Ishwar Singh Bhardwaj, Director, Indian Petrochemical Corporation Ltd. (IPCL), Vadodara

Lalitha B. Singh, Adviser (Petrochemicals), Ministry of Chemicals and Fertilizers, Government of India, Shastri Bhavan, New Delhi (Telephone: 38-25-75)

Indonesia

Agus Ismail, Business Development Manager, PT Petrokimia Gresik (PERSERO), Jl. Jend. Akhmad Yani, Gresik, East Java (Telephone: 0061-031-98-21-00 or 98-22-00; Telefax: 98-17-22; Telex: 31 477 petrog ia)

Restu Widiyarsono, Business Development Department, PT Petrokimia Gresik (PERSERO), Jl. Akhmad Yani, Gresik, East Java (Telephone: 0061-031-98-21-00 or 98-22-00; Telefax: 98-17-22; Telex: 31 477 petrog ia)

Iran (Islamic Republic of)

Ali Asghar Tofigh, Deputy Minister of Industry for Research and Training, Ministry of Industry, Tehran

Ahmad Rahgozar, Deputy Petroleum Minister and President of the National Petrochemical Company (NPC), P.O. Box 7484, Tehran (Telephone: 98 21 88 22 095)

Ahmad Ahmadi, Counsellor, Permanent Mission of the Islamic Republic of Iran to UNIDO, Jaurèsgasse 3, 1030 Vienna, Austria

Azar Abbasi, Engineer, Amir Kabir University, Teleghani Ave., Hafez Ave., Tehran (Telephone: 278 788)

Kamran Afshar, Compounding Manager, Kian Tire, Saveh Road, 11th Kilometer, Tehran (Telephone: 99 20 34)

Reza Afshin, Head of Engineering, Research and Development, National Petrochemical Company, Tehran (Telephone: 021 83 15 92)

Azam Afzalian, Expert, Institute of Standards and Industrial Research of Iran, Arjantin Square, Alvand Street, Mabeez Street No. 7, 4th Floor, Karaj

Javad Aghabozorgy, Research Manager, Melli Agrochemical, Takht Tavvos Ave. No. 176, Tehran (Telephone: 88 20 700)

Jahanbakhsh Ahmadi, Process Engineer, National Petrochemical Company, Karimkhan Zand Ave., Tehran (Telephone: 714 22 31)

Zoreh-Zahra Ahmari, Head, Chemical Division, National Petrochemical Company, Karimkhan Zand Ave., Tehran (Telephone: 88 27 27)

Karim Akbari Haghighi, Director, Chemical Department, Institute of Standards and Industrial Research of Iran (ISIRI), Karadje (Telephone: 0261 22 522)

Jebraeil Akbari Mehrabani, Plant Manager, Air Separation, Arak Petrochemical Complex (ARPC), P.O. Box 575, Arak

Mohammad Taghi Alagha, Head, Production of Chemical Cellulosic Industries, Ministry of Industry, North Nejatollahi Ave., Tehran (Telephone: 81 06 22 19 or 81 06 22 02)

Mohamad Reza Amani Checani, Arak Petrochemical Company, Calleg, Tabriz (Telephone: 34 401-2 8 20 007-8)

Hojjatollah Amani, Deputy Marketing Manager, Behran Oil Co., Khaled Eslamboly Ave. No. 2, 21st St., Tehran (Telephone: 86 62 801)

Akbar Amini, General Director of Parliament Affairs, Ministry of Industry, Ave Nejatollahi, Tehran (Telephone: 89 01 98)

Morteza Amini, Dean, Technical Faculty of Metro (Tehran Urban and Suburban Railway Co.), Ostad Mottahari Ave., Mir-Emad St. No. 37, Tehran (Telephone: 021 70 30 40; Telefax: 021 70 30 31; Telex: 21 56 76 tusr ir)

Mohammad Sadegh Atrvash, Executive of the Board of Directors, National Iranian Oil Company, No. 137 Dr. Fatemi Ave., Tehran (Telephone: 65 00 61)

Bahram Azad, Public Relations Manager, Erection and Construction Company, Abiverdi Blvd., Shiraz (Telephone: 021 80 89 964 or 071 66 21 72; Telex: 33 25 71 pecc ir)

Maryam Azari, Proposals and Estimation Manager, Erection and Construction Company, Abiverdi Blvd., Shiraz (Telephone: 021 89 89 964; Telex: 33 25 71 pecc ir)

Karim Bahedory, Director, Harigh Company, Ministry of Industry, Kh. Doulat-kh-Kaykavoos, 16 Alley, No. 1, 19397, Tehran (Telephone: 26 79 26; Telefax: 88 26 694)

Hassan Beigi, Operation Manager, Arak Petrochemical Complex (ARPC), P.O. Box 575, Arak

Nader Berenjian, Consultant, Ministry of Industry, Tehran (Telephone: 81 06 22 13/14)

Hassan Cheraghi, General Manager, Training and Manpower Development, National Petrochemical Company (NPC), Tehran (Telephone: 88 27 159; Telex: 21 27 59 or 21 35 20)

Bahram Dabir, Faculty Member, Ami-Kabir University, Tehran (Telephone: 61 39 394; Telex: 21 42 69)

Golamhossein Darzi, Expert, Ministry of Foreign Affairs, Tehran (Telephone: 32 12 284)

Soheila Djabbarpour, Expert, Chemical and Cellulosic Department, Ministry of Industry, Tehran (Telephone: 81 06 22 01)

Shahan Doosian, Market Research, National Petroleum Company, Tehran (Telephone: 71 42 254)

Said Abdolah Said A. Ebrahimian, Director, National Petrochemical Company, Karimkhan Zand Ave., Tehran (Telephone: 88 26 324)

Farshid Emani, Directing Manager, Parsulfite Chemical Company, 3rd Floor, 71 South Sohvevardi Ave., Tehran (Telephone: 84 92 91)

Amir Hassan Fallah, Deputy Finance Director, National Petrochemical Company, Karimkhan Zand Ave. No. 54, P.O. Box 7484, Tehran (Telephone: 83 64 52)

H. Fallahi, Project Manager, National Research Council of Iran, No. 31, Alvand Street, Tehran (Telephone: 021 68 04 36-8; Telefax: 021 68 60 58)

Mohsen Fakhimi, Manager, Audiovisual Section, Erection and Construction Co., Abiverdi Blvd., Shiraz (Telephone: 071 66 79 61 or 021 8089 964; Telex: 33 25 71 pecc ir)

Valoutia Gasparians, Director of Education, Institute of Standards and Industrial Research of Iran (ISIRI), Karaj (Telephone: 26 031-8)

Seyed Ali Ghaffari, Managing Director, Dena Tiyev Iran, Nioo, Noz Africa Expressway, Tehran (Telephone: 29 77 37 or 29 37 16; Telefax: 021 29 90 65; Telex: 21 50 87 otrc ir)

Abolhassan Ghandehari, Corporate Planning Department, National Petrochemical Company, P.O. Box 7484, Tehran (Telephone: 88 22 092)

Tahereh Ghassemy, Analyst, Ministry of Industry, Vila Ave., Kalantari Ave., Tehran (Telephone: 81 06 23 55)

Mohammad Gheisi, Member of Board, Dena Tire Company (DENA), Africa Ave., Tehran (Telephone: 22 89 730)

Seyed Gholamraza Mostajahodaveh, Operation Manager, Area 1, Arak Petrochemical Complex (ARPC), P.O. Box 575, Arak

Iraj Goodarznia, Professor, Sharif University of Technology, P.O. Box 11365, 9465, Tehran (Telephone: 91 82 41; Telefax: 0098-21-69 92 983; Telex: 21 28 82)

Rayatallah Haghi, Head, Process Engineering, National Petrochemical Company, Karimkhan Zand Blvd., Tehran (Telephone: 62 47 75)

S.M.A. Hashemi, Planning and Systems Manager, Behran Oil Co, Ghaled Eslamboly Ave., 21st St., No. 21, Tehran (Telephone: 65 60 05; Telefax: 62 59 91)

Hossain Hashemi Rafat, Expert of Chemical Cellulose, National Iranian Industrial Organization (NIIO), Dr. Fatemi Ave. No. 133, Tehran (Telephone: 65 54 96; Telex: 65 00 010)

Afagh Homaei, Technical Expert, National Petrochemical Company, Karimkhan Zand Ave., Tehran

Maliheh T. Hosseinlou, Consultant, National Petrochemical Company, Karimkhan Zand Ave., Tehran (Telephone: 82 37 78)

Masoud Izadi, Head, Cost Estimation and Utilities Analysis, National Petrochemical Company, Hafte Tir Sq., Tehran (Telephone: 88 25 128 or 71 42 230)

Nasser Jalali, Project Manager, Research and Engineering, National Iranian Industrial Organization (NIIO), Dr. Fatemi Ave., Tehran (Telephone: 65 00 61)

Zahra Jari, National Focal Point INTIB-UNIDO, Ministry of Industry, P.O. Box 15815, 3751 Tehran (Telephone: 88 01 778)

Yahya Jirsarai, Chief, Research and Development Chief, Ministry of Industry, Tehran-Nehatahehi (Telephone: 81 06 25 34)

Mohammad Reza Jazayeri, General Manager, International Affairs, National Petrochemical Company, P.O. Box 7484, Tehran (Telephone: 88 20 021)

Asghar Kaji, Technical Director, National Petrochemical Company, Tehran (Telephone: 83 30 20)

Mohammad Hosein Kalantar Metamedi, Deputy President, Institute of Standards and Industrial Research of Iran (ISIRI), Industrial City of Karaj, Karaj (Telephone: 0261 28 412; Telex: 66 02 279)

Esfandiar Karimzadegan, Acting Director, Department of Planning, National Petrochemical Company, P.O. Box 7484, Tehran (Telephone: 83 48 09 or 88 25 224; Telefax 88 22 087)

Mohammad Khayat, Head of Engineering (Engineering and Supervision Affairs), National Petrochemical Company, No. 11 St. No. 10, Farahani Ave., Tehran (Telephone: 62 44 75)

Parviz Lolavar, Adviser to the Minister, Ministry of Industry, Ave. Nejatollahi, Tehran (Telephone: 89 10 80)

Nasrin Mancochehri, Expert in Polymers, National Petrochemical Company, 7 Tire Sq., Tehran (Telephone: 71 42 264)

Ebrahim Manoucheri, Senior Consultant, Petrochemical Industries Investment Company, 39 Armaghan St., Vali Asr Ave., Tehran (Telephone: 80 88 525; Telex: 21 36 14 nce ir)

Shahbaz Mansouri, Head, Polymer Section, National Petrochemical Company, Karimkhan Zand Ave., Tehran (Telephone: 88 21 166 or 83 27 75)

Shounsadine Mirdamadi, Materials Research Centre, University of Science and Technology, Narmak, Tehran (Telephone: 77 00 40-5)

Abdolreza Moein, Manager, Marketing and Strategic Planning, Erection and Construction Company, P.O. Box 71455-467, Shiraz (Telephone: 98 71 66 95 63 or 66 95 62; Telex: 33 25 71 pecc ir)

Karim Mokhtarzadeh, International Commercial Manager, Melli Agrochemical Company, No. 178 Ostad Motahharri Ave., Tehran (Telephone: 88 34 879)

Taghi Morshedi, Member of the Board, Arak Petrochemical Company, Enghlab Ave., Tehran (Telephone: 83 62 55)

Foroozan Moshrefi, Chemical Expert, Ministry of Industry, Kalantary Ave., Tehran (Telephone: 81 06 23 22)

Mehdi Nafisi, Project Evaluation Manager, National Petrochemical Company, P.O. Box 7484, Tehran (Telephone: 88 20 378 or 71 42 239; Telefax: 88 22 087; Telex: 212 759)

Ali Nejabat, Editor, *ECC Journal*, Erection and Construction Company, Abiverdi Blvd., Shiraz (Telephone: 071 66 21 72; Telex: 33 25 71 pecc ir)

Mahmoud Nouri, Managing Director, Esfahan Petrochemical Company, Esfahan (Telephone: 54 10 58)

Mehdi Parva Mehdi, Assistant, Metro Technical Institute, Tehran Metro, Ministry of Industry, No. 40, Akhlaghi St., Djavanshir, Gholehack, 19397 Tehran (Telephone: 021 26 39 46 or 78 28 764; Telefax/Telex: 021 70 30 31)

Mohamad Sadegh Parvizi, Research and Development, National Petroleum Company, Tehran

Rassul Pishva, Industries Office of West Azarbaijan (Planning Office), Ministry of Industry (Total Office of West Azarbaijan), No. 48, Arkideh Alley, El Goly Rd, Tabriz (Telephone: (41 22 681-3)

Hossein Pouraghasi, Director, Chemical and Cellulosic Division, National Iranian Industries Organization (NIIO), Dr. Fatemi Ave. No. 133, Tehran (Telephone: 65 55 86 or 65 44 08)

Bahman Reza Pourjafar, Head, Process Industrial Engineering, Petrochemical Industries Design and Engineering Company (PIDEC), P.O. Box 71455-467, Shiraz (Telephone: 071 56 116 or 57 301)

Mohammad Hadi Rahbari, Deputy Managing Director, National Petrochemical Company, No. 46 Karimkhan Zand Blvd., Tehran (Telephone: 88 22 327)

Rahim Rahim-Mofared, Adviser to the Minister, Ministry of Industry, Tehran (Telephone: 89 108)

Davood Rashtchian, Head, Department of Chemical Engineering, Sharif University of Technology, Azadi Street, Tehran (Telephone: 80 17 180)

Faramarz Rasti, Ministry of Industry, Tehran (Telephone: 81 06 22 14)

Fowizeyh Sabah, Expert, Ministry of Industry, Tehran (Telephone: 81 02 201 or 81 02 221)

Mohamad Saberian, National Petroleum Company, Karimkhan Zand Ave., Tehran (Telephone: 88 25 219)

Davar Samadzadegan Davar, Managing Director, PASAB, 7th Tir Square Manyaven No. 83, 3rd floor, Tehran (Telephone: 83 93 14-15; Telefax: 83 93 15)

Cyrus Samii, Petroleum and Petrochemical Consultant, 2, Nahid Sharghi St., Africa Expressway, Tehran 19157 (Telephone: 222 66 72)

Sasan Saremi, Operation Manager, Air, Water and Fuel Unit, Arab Petrochemical Complex (ARPC), P.O. Box 575, Arak

Behzad Sepehrband, Manager of Research and Development, Organization of Mines and Petroleum Industries, Bonyad Most Azafan Va Janbazan, No. 2/1, 21st St., Khaled Estanboli Ave., Tehran (Telephone: 0098 21 88 66 049; Telefax: 62 59 91; Telex: 21 37 81 boc ir)

Eskandar Setoudeh, Manager (Member of the Board), Dena Tire Manufacturing Company, No. 2, Africa Expressway, Tehran (Telephone: 29 39 16 or 29 77 37)

Mansoor Shakry, Total Management of Industries Office of West Azarbaijan, Total Industries Office of West Azarbeijan, Tabriz (Telephone: 22 861 3)

Jalaleddin Shayegan, Professor, Sharif University, Azadi Ave., Tehran (Telephone: 60 05 819 or 918 589)

Abbas Shirazi, Ministry of Industry, Tehran (Telephone: 81 06 22 04)

Abdolahh Sobhanirad, Commercial Management, PASSABIO, 7th Tir Square Many Ave. No. 83, 3rd floor, Tehran (Telephone: 83 93 14; Telefax: 83 93 15)

Mehrdad Tabrizi, Engineer, Plasturan Meg. Co., Km. 13, Old Karaj Road, Tehran (Telephone: 60 28 928, 29, 31; Telefax: 60 28 870)

Farawaz Tajik, Expert on UNIDO Coordination Commission, Ministry of Industry, Sepahbad Gharanei, Shahid Kalantari Ave., 8th floor, Tehran (Telephone: 81 06 25 44)

Hossein Torab, Member of the Board, SAHAND, Km. 6, Karj Road, Tehran (Telephone: 60 23 218 19)

Reza Yousefi, Expert, Ministry of Industry, Tehran (Telephone: 89 02 71)

Alireza Zaherzadeh, Manager, Corporate Planning, National Petrochemical Company, Karimkhan Zand Ave., Tehran (Telephone: 88 26 993)

Huschang Zanganeh, Ministry of Industry, Tehran (Telephone: 81 06 22 14)

Hossein Zared, Industry Planning (Plans and Programmes), Ministry of Industry, Dash Darban Val., Sheshgelan Ave., Tabriz (Telephone: 041 22 681-3)

Iraq

Emad Hussain Ali Al Ani, Director General for Petrochemical Project, Ministry of Industry and Minerals, P.O. Box 5815, Baghdad (Telephone: 88 62 006)

Abdulla Louay, Engineer, The State Enterprise of Petrochemical Industries, Bashrah, Kour Al Zuber

Libyan Arab Jamahiriya

Anwar Arif, Marketing Officer (OLEFINS), National Oil Corporation, P.O. Box 4768, Tripoli (Telephone: 37 148; Telex: 20 729 or 20 731)

Salem Takitk, Specialist Engineer in Refinery and Petrochemical Industry, National Oil Corporation, P.O. Box 4768, Shara Sade, Tripoli (Telephone: 46 181; Telex: 20 729 ir 29 731)

Malawi

Elijah Jailos Kumwenda, General Manager, Plastic Products Ltd., P.O. Box 907, Blantyre (Telephone: 670 455 or 670 176; Telex: 44 708; Telefax: 67-06-64)

Malaysia

Abd. Halim Bin Che Abas, Strategic Planner, PETRONAS, P.O. Box 12 444, 50778 Kuala Lumpur (Telephone: 603-27-53-936; Telefax: 603-29-32-793)

Khairul (Anuar) Abdullah, Deputy Director, Economic Planning Unit, Department of the Prime Minister, 4th Floor, Block G, Jalan Dato' Onn, 50502, Kuala Lumpur (Telephone: 603-29-03-735)

Mali

Amadou Oumar Sy, Directeur du laboratoire pétrolier, Direction des mines et de la géologie, B.P. 223, Bamako (Téléphone: 223-22-63-19 ou 22-58-21; Téléfax: 223-22-71-74)

Namibia

Mburumba Appolus, Energy Economist, Ministry of Mines and Energy, Private Bag 13297, Trust Bank Centre, Independence Ave, Windhoek (Telephone: 264-61-22-65-71)

Nigeria

Daniel Ogugua Egbuna, Manager, Nigerian National Petroleum Corporation (NNPC), 9 Wharf Road, Apapa, Lagos (Telephone: 01-87 12 68; Telex: 23139 nnpc ng)

Basheer Abubakar Koko, Officer-in-Charge of Sales, Elenie Petrochemical Co. Ltd. (Subsidiary of NNPC), Waterlines House, Aba Road, Port Harcourt (Telephone: 084-30 10 70 ext. 303)

Eric Obiora Okeke, Engineer, Research and Development Division, P.M.B. 5342, Nigerian National Petroleum Corporation, Port Harcourt

Poland

Zbigniew Szulc, Deputy Director, Ciech-Petrolimpex, 46/50 Powazkowska St., Warsaw (Telephone: 63-91-800)

Romania

Constantin Roncea, Engineer and Deputy Director, Petrobrazi S.A., 2011 Prahovo, Ploiesti (Telephone: 0041-14-31-21/1421)

Saudi Arabia

Ahmed Al Jassir, Regional Manager, SABIC Marketing Ltd., P.O. Box 59090, Riyadh 11525 (Telephone: 0096 61 40 57 203)

Mohammed A. Al-Sheikh, Area Sales Manager, SABIC Marketing Ltd., P.O. Box 59090, Riyadh 11525 (Telephone: 0096 61 40 12 033)

Slovakia

Ľubomir Kukvòka, Department Manager, Vucht A. S., Nobelova 34, 836 03 Bratislava (Telephone: 0042 7 25 05 14)

Miloslav Riska, Director, Vucht A. A., Nobelova 34, 836 03 Bratislava (Telephone 0042 7 25 05 14)

Thailand

Pramote Chaiyavech, Adviser, National Petrochemical Public Co. Ltd., Sinothai Building Asoke Rd., Sukhumvit 21, Bangkok (Telephone: 26 01 311; Telefax: 26 01 318)

Piyavute Na Padalung, Director of Division, Office of Industrial Economics, Ministry of Industry, 75/6 Rama VI Rd, Ratchathewi, Bangkok 10400 (Telephone: 245 80 74)

Djakkrit Puranasamriddhi, Deputy Permanent Secretary for Industry, Ministry of Industry, Rama VI Rd, Bangkok 10400 (Telephone: 246 11 37)

Nuttha Toonsuwan, Industrial Technical Officer, Office of Industrial Economics, Ministry of Industry, Rama VI Rd., Bangkok 10400 (Telephone: 662 245 67 04)

Togo

Lankoumanon Boukari, Directeur du développement industriel, Ministère de l'industrie et des sociétés d'Etat, B.P. 831, Lomé (Téléphone: 00228-21-22-89; Téléfax: 00228-21-43-05)

Turkey

Mehmet Sinan Can, Product Manager, Aksa Akrilik Kimya San A.S., Miralat Sefik Bey, Sok. 15/17, Gümüssuya-Taksim, Istanbul (Telephone: 90-1-212-25 19 200; Telex: 24781 akex tr or 25614 ipex tr or 24334 akex tr)

Bilge Firat, Planning Expert, State Planning Organization, Devlet Planlama Teskilati Müstejarhgi, Iktisadi Planlama Genel Müdustugu, Necatikey Cad. 108, Yucetepe, Ankara (Telephone: 23 08 720/6001; Telefax: 23 01 6930)

Uganda

Margaret Mary Naiga Kayemba, Managing Director, Uganda Plastic Industries (1979) Ltd., P.O. Box 11203, Plot 12, Buwuma Rd., Portbell, Kampala

United Republic of Tanzania

George Mkassi, Head, Sector of Chemical Industries, Ministry of Industry and Trade, P.O. Box 9503, Dar es Salaam (Telephone: 22 748 or 22 775/9; Telex: 41 689)

Zaire

Kasende Okuma, Directeur, Chef de département, Commission nationale de l'énergie, Ministère de l'énergie, Avenue de la Justice 239, Kinshasa-Gombe

International organizations

Syed Nasir Ali Mirza, Manager, Industrial Investment, Islamic Chamber of Commerce, Industry and Commodity Exchange, P.O. Box 3831, Clifton, Karachi 75600, Pakistan (Telephone: 53 05 35/53 06 46/5874756; Telefax: 5870765)

Annex II

LIST OF DOCUMENTS

Discussion documents

Title	*Document symbol*
The current status of and future prospects for the downstream petrochemical industries in the developing countries: Discussion paper	ID/WG.533/1
Manufacturing and application technologies of downstream petrochemical industries/Marketing of and market development for petrochemicals: Issue paper	ID/WG.533/2
Technical report: National strategies for the development of downstream petrochemical industries in the developing countries	ID/WG.533/3(SPEC.)
Technical report: Environment protection in the downstream petrochemical industries	ID/WG.533/4(SPEC.)

Background documents

Report: Global Preparatory Meeting for the Consultation on Downstream Petrochemical Industries in the Developing Countries, Vadodara, India, 23-25 February 1993	IPCT.180(SPEC.)
Report: Regional Consultation on the Petrochemical Industry in the Arab Countries, Innsbruck, Austria, 22-25 June 1992	ID/WG.524/3

Reference documents

Project profile on a downstream petrochemical product for the Arab region: Cumene	PPD.156(SPEC.)
Project profile for the establishment of dioctyl phthalate (DOP) production plants in the Arab world	PPD.157(SPEC.)
Project profile for the establishment of polyamide production plants in the Arab world	PPD.158(SPEC.)
Project profile on a downstream petrochemical product in the Arab region: Maleic anhydride	PPD.159(SPEC.)
Project profile for the establishment of polyol production plants in the Arab world	PPD.160(SPEC.)
Study on trends in technological development in the petrochemical industry	ID/WG.522/1(SPEC.)
The development of integrated petrochemical industry in the Arab region	ID/WG.522/2(SPEC.)
Directory on technological capabilities in developing countries related to the petrochemical industry	Draft
Petrochemical downstream processing industry in India	Draft

UNIDO ONUDI

SYSTEM OF CONSULTATIONS | **SYSTEME DE CONSULTATIONS** | **SISTEMA DE CONSULTAS**

Documentation Service

Please, return to:
UNIDO
System of Consultations
P.O. Box 300
A-1400 Vienna, Austria

Service de documentation

Prière de retourner à :
ONUDI
Système de Consultations
B.P. 300
A-1400 Vienne, Autriche

Servicio de Documentación

Sírvase devolver a :
ONUDI
Sistema de Consultas
P.O. Box 300
A-1400 Viena, Austria

PLEASE PRINT VEUILLEZ ECRIRE EN LETTRES D'IMPRIMERIE SIRVASE ESCRIBIR EN LETRAS DE IMPRENTA

(1) Last name - Nom de famille - Apellido

(2) First name (and middle) - Prénom(s) - Nombre(s)

(3) Mr./Ms. - M./Mme - Sr./Sra.

(4) Official position - Fonction officielle - Cargo oficial

(5) Name of organization *in full* - Nom de l'organisation *en toutes lettres* - Nombre *completo* de la organización

(6) Official address - Adresse officielle - Dirección oficial

(7) City and country - Ville et pays - Ciudad y país

(8) Telephone — Téléphone - Teléfono

(9) Telex

(10) If you wish to receive our documents, please indicate sectors of interest
Si vous souhaitez recevoir nos documents, veuillez indiquer les secteurs d'intérêt
En caso de que desee recibir nuestros documentos, sírvase indicar los sectores de interés para Ud.

COUNTRY / ORGANIZATION

Printed in Austria
V.94-20629—February 1994—1,800

ID/394
(ID/WG.533/5)